



TEPIC™: A high temperature, high strength, light weight material

Fact Sheet

TEPIC™ was initially formulated as a high temperature, high strength structural support foam for Defense Program applications. It has also been demonstrated an excellent material for machined or molded-to-shape prototype tooling for composites manufacturing.

Most tooling for composites is made from metals, which can be expensive, difficult to repair and heavy and unwieldy in larger tools. TEPIC™, in contrast, is 5 to 10 times more affordable than bulk aluminum (6061-T6) and its density is approximately 4 times lower. Compared to dense Invar 36, TEPIC is approximately 10 times less expensive.

Other light-weight polymer-based materials have limited utility due to their maximum-use temperature of less than 250°F. Many of these materials are also only available as thin-slab stock, so larger applications require bonding multiple boards together.

TEPIC's high temperature stability (greater than 400°F) is among its many advantages. It can be cast as an oversize billet and machined to final shape or, if a mold is available, formed to final shape. Fine features have successfully been machined and replicated on the molded surface. A gloss finish is possible using commercial gel coats.



20-Kg pour of TEPIC™ and machined structural part



Machined TEPIC™ with gel coat and composite part

Features:

- *Machined or molded to final shape*
- *Easy processing*
- *Uses commercially available ingredients*
- *Greater section thickness than other board stock*
- *Machineable to rough dimensions prior to cure*
- *Good for autoclave processing over 400°F*
- *Accepts gel coat for high-gloss surface*
- *No epoxide inhibition*
- *Repairable*

**Envisioned applications include:**

- *Tooling for composites manufacturing*
 - *Machine to shape*
 - *Mold to shape*
- *Prototype-injection-molding tooling*
- *Hot embossing tooling*
- *High temperature adhesives*
- *Structural / core material*
- *High temperature insulation*

Properties

Compression strength, 77°F

Compression strength, 392°F

Modulus

Coefficient of thermal expansion, 77-257°C
with low CTE filler

Density range

Size limitations

Cure

Maximum use temperature

>7000 psi

>4000 psi

300,000 psi

$2.7 \times 10^{-5} \text{ } ^\circ\text{F}^{-1}$

$1.6 \times 10^{-5} \text{ } ^\circ\text{F}^{-1}$

0.3-0.8 g/cm³

greater than 24" x 24" x 8"

400°F

>400°F

For information regarding possible collaboration towards commercialization or licensing opportunities, contact Jim Wilhelm at (925) 294-3673, jpwilhe@sandia.gov.